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10/005,193	12/04/2001	Trista P. Chen	200302024-1	6949

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EXAMINER

EHICHIOYA, FRED I

ART UNIT

PAPER NUMBER

2162

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/005,193

Applicant(s)

CHEN ET AL.

Examiner

Fred I. Ehichioya

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1 - 10, 18 - 21, and 36 - 41 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 - 10, 18 - 21, and 36 - 41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 1 – 10, 18 – 21, and 36 - 41 filed October 27, 2004 has been fully considered but they are not persuasive for the following reasons.

#### ***Clarification on the allowability of claim 19***

2. The objection to claim 19 on page 1 of last Office Action is a typographical error and should be disregarded. The rejection of claim 19 on page 7 is proper.

3. Applicants argue:

(a) Claim 1 recites "each of the match descriptors corresponding to multidimensional space having more than two dimensions." Ferrell in view of Kim does not teach or suggest this limitation (Page 11, Para 1).

(b) As noted, Kim teaches an image descriptor that stores a plurality of image descriptors of the extracted images. Kim, though, does not teach not teach image descriptors in multidimensional space (Page 12, Para 2).

Examiner respectfully disagrees with all of the allegations as argued. Examiner, in his previous office action, gave detail explanation of claim limitations and pointed out exact locations in the cited prior art.

In response to Applicants' argument (a), Examiner wishes to thank the applicants for pointing out and agreeing that Kim teaches "an image descriptor that stores plurality

of image descriptor". However, Ferrell in view of Kim and further in view of Schuetze teach each of the match descriptors corresponding to multidimensional space having more than two dimensions (see Schuetze column 9 line 61 – column 10, line 4 and column 15, lines 41 – 44). The motivation to combine cited reference is that Schuetze's system would have allowed Ferrell and Kim's system to set forth a framework for multi-modal browsing and clustering. This framework enhances browsing, searching, retrieving and recommending contents in a collection of documents as suggested by Schuetze at column 5, lines 45 – 60.

In response to Applicants' argument (b), please refer to response to argument (a) and hereby reiterate that Ferrell in view of Kim and further in view of Schuetze teach image descriptors in multidimensional space.

4. In view of the above, the examiner contents that all limitations as recited in the claims have been address in this Action. For the above reasons, Examiner believed that rejection of the last Office action was proper.

**Claim Rejections - 35 USC § 103**

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1 – 5, 8, 9, 18, 20, 21, 36, 37, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S Patent 6,751,343 issued to Regina K. Ferrell et al (hereinafter "Ferrell") in view of U.S. Patent 6,754,667 issued to Whoi-Yul Kim et al (hereinafter "Kim") and further in view of U.S. Patent 6,598,054 issued to Hinrich Schuetze et al (hereinafter "Schuetze").

Regarding claims 1 and 18, Ferrell teaches a method for storing and retrieving image data comprising:

providing a plurality of match images (see column 5, lines 47 – 50);

mapping into the database to determine a close match of the target descriptor among the organized match descriptors, a close match determined by a distance to a near match descriptor within a predetermined threshold, the mapping further comprising (see column 4, line 64 – column 5, line 37):

selecting a candidate match descriptor from among the organized match descriptors (see column 5, lines 38 – 50);

Ferrell does not explicitly teach computing a match descriptor corresponding to a multidimensional space indicative of each of the match images; organizing each of the match descriptors in a database according to a predetermined similarity metric, the similarity metric operable to indicate match descriptors that are near to other match descriptors in the multidimensional space; receiving a target image for which a match is sought; computing a target descriptor indicative of the target image; and

returning the candidate match descriptor if the candidate match descriptor is a match to the target descriptor, the match being determined by a similarity metric.

Kim teaches computing a match descriptor corresponding to a multidimensional space indicative of each of the match images (see column 3, lines 53 - 57)

organizing each of the match descriptors in a database according to a predetermined similarity metric, the similarity metric operable to indicate match descriptors that are near to other match descriptors in the multidimensional

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space (see column 6, lines 8 - 20)

receiving a target image for which a match is sought (see column 6, lines 32 – 33);

computing a target descriptor indicative of the target image (see column 6, lines 33 – 36); and

returning the candidate match descriptor if the candidate match descriptor is a match to the target descriptor, the match being determined by a similarity metric (see column 1, lines 19 – 30).

Ferrell or Kim does not explicitly teach a multidimensional space having more than two dimensions.

Schuetze teaches a multidimensional space having more than two dimensions (see column 9, line 61 – column 10, line 4 and column 15, lines 41 – 44).

It would have been obvious to one of ordinary skill in the data processing art at the time of the present invention to combine teaching of the cited references because Kim's teaching of "computing a match descriptor corresponding to a multidimensional space indicative of each of the match images" would have allowed Ferrell's system to provide a content-based image retrieval system and a method for retrieving image using same, which are possible to search more similar image to a query image within a shorter time as suggested by Kim at column 2, lines 11 - 16.

Further, Schuetze's system would have allowed Ferrell and Kim's system to set forth a framework for multi-modal browsing and clustering. This framework enhances

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browsing, searching, retrieving and recommending contents in a collection of documents as suggested by Schuetze at column 5, lines 45 – 60.

Regarding claim 2, Kim teaches a match descriptor is a vector quantity (see column 4, lines 62 – 63).

Regarding claim 3, Kim teaches the correspondence is a similarity of the match descriptors (see column 3, lines 6 – 9).

Regarding claim 4, Ferrell teaches the predetermined metric is a distance metric (see 12, lines 38 – 41).

Regarding claim 5, Kim teaches the distance metric is derived from a similarity metric, the similarity metric operable to determine match descriptors near to other match descriptors based on a distance in the multidimensional space (see column 6, lines 8 – 20).

Regarding claim 8, Ferrell teaches the match descriptors are invariant descriptors (see column 7, lines 42 – 43).

Regarding claim 9, Ferrell teaches the invariant descriptors are insensitive to geometric translations (see column 7, lines 43 – 67).



Regarding claim 19, Kim teaches selecting another candidate match descriptor if the candidate match descriptor is not a match to the target descriptor, the selecting occurring from among match descriptors organized near the candidate match descriptors (see column 2, lines 44 – 53).

Regarding claim 20, Kim teaches wherein near match descriptors are similar vectors in the multidimensional space (see column 6, lines 8 – 20).

Regarding claim 21, Kim teaches the similarity metric is a set similarity metric (see column 6, lines 8 – 20).

Regarding claim 36, Schuetze teaches wherein the predetermined metric is a distance metric that is derived from a similarity metric, the similarity metric defines a similarity between match descriptors that define images in terms of exclusion of attributes (see column 11, lines 34 – 42 and column 16, lines 27 – 61).

Regarding claim 37, Schuetze teaches wherein the predetermined metric is a distance metric that is a set intersection metric, the set intersection metric defines a ratio of a number of elements common to two sets and a total number of unique elements in the two sets (see column 23, lines 52 – 59).

Regarding claim 39, Schuetze teaches wherein the multidimensional space has more than two dimensions (see column 15, lines 41 – 44).

Regarding claim 40, Schuetze teaches wherein the similarity metric defines a similarity between match descriptors and the target descriptor that defines images in terms of exclusion of attributes (see column 9, line 65 – column 10, line 4 and column 19, lines 3 – 53).

7. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrell in view of Kim and further in view of Non-Patent Literature “Relatives of Fourier transform,” The Fourier Transform and Its Applications, McGraw –Hill, New York, NY, pp. 241 – 274 (1978) by Bracewell, R. (hereinafter “Bracewell”).

Regarding claim 6, Ferrell or Kim does not explicitly teach Fourier-Mellin.

However, Bracewell teaches computing the match descriptor includes computing a Fourier-Mellin Transform (FMT) (see Pages 241 – 242).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine teaching of Bracewell with the teaching of Ferrell and Kim wherein FMT implores the use of pattern recognition process for the previously designated pattern from a set of data or images. Previously designated pattern is described by invariant descriptors. The motivation is that using Fourier-Mellin Transform facilitates the locating of previously designated pattern.

Regarding claim 7, Bracewell teaches vector quantization of the FMT (see pages 257 – 262).

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrell in view of Kim and further in view of Non-Patent Literature "Similarity search in High Dimensions via Hashing," Proceedings of the 25<sup>th</sup> VLDB (Very Large Database) Conference, Edinburgh, Scotland, (1999) By Gionis, A. et al (hereinafter "Gionis").

Regarding claim 10, Ferrell or Kim does not explicitly teach Locality-Sensitive Hashing (LSH).

Gionis teaches the organizing according to a predetermined metric further comprises Locality-Sensitive Hashing (LSH) (see sections 3.1 and 3.2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine teaching of Gionis with the teaching of Ferrell and Kim wherein LSH is used to solving memory algorithmic problems. The motivation is that Locality-Sensitive Hashing is more efficient for indexing in high-dimensional data.

9. Claims 38 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrell in view of Kim, Schuetze and further in view of Non-Patent Literature "On the resemblance and containment of documents", IEEE Computer society pp. 21 – 29 (1998) by Broder, A.Z. (hereinafter "Broder").

Regarding claim 38, Ferrell, Kim and Schuetze teaches the claimed subject matter as discussed in claim 37.

Broder teaches wherein given two different descriptors A and B with a distance D between two images, the set intersection metric is  $D(A, B) = \frac{|A \cap B|}{|A \cup B|}$  (see page 24, section 3).

It would have been obvious to one of ordinary skill in the data processing art at the time of the present invention to combine teaching of the cited references because Broder's teaching of "the set intersection metric" would have allowed Ferrell, Kim and Schuetze's system to reduce issues of set intersection problems that can be easily evaluated by a process of random sampling that can be done independently for each document as suggested by Broder at page 21 (Abstract).

Regarding claim 41, Broder teaches wherein the distance is defined by a set intersection metric that defines a ratio of a number of elements common to two sets and a total number of unique elements in the two sets (see page 21 (Abstract) and page 28, section 4.4).

***Conclusion***

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred I. Ehichioya whose telephone number is 571-272-4034. The examiner can normally be reached on M - F 8:00 AM to 4:30 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Breene can be reached on 571-272-4107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Fred I. Ehichioya  
Patent Examiner  
Art Unit 2162

March 15, 2005



SHAHID ALAM  
PRIMARY EXAMINER